

### **REMARKS**

Applicants appreciate the thorough examination of the present application as reflected in the Official Action mailed September 24, 2003. Applicants also appreciate the indication of allowable subject matter in Claims 15, 21, 22, 26, 32, 38 and 39. Applicants have cancelled the non-elected method claims and have amended Claim 1 to incorporate the recitations of Claim 3. Claim 3 has been cancelled. Claim 83 has been amended to incorporate the recitations of Claim 85. Claim 85 has been cancelled. Applicants have written Claims 15 and 32 in independent form but have not included each of the recitations of the intervening claims. Claims 21, 26 and 38 have been written in independent form. Applicants have amended Claim 12 to recite that the second n-type regions do not extend substantially past the periphery of the p-type regions.

Applicants submit that Claims 15, 21, 26, 32 and 38 are patentable over the cited references as Applicants have written these claims in independent form. Applicants submit that the remaining claims are also patentable over the cited references for at least the reasons discussed below.

#### **The IDS**

Applicants wish to bring to the Examiner's attention an IDS of materials that is being submitted concurrently with the present Amendment. Applicants request that the materials be considered by the Examiner and that an initialed copy of the PTO-1449 form be returned with any subsequent action.

#### **The Obviousness Rejections**

Claims 1-4, 6, 7, 10-12, 17-19, 23-25, 33-36, 40, 41, 83-86 and 89 stand rejected under 35 U.S.C. § 103 as obvious in light of United States Patent No. 6,165,822 to Okuno et al. (hereinafter "the '822 patent") and Chung et al. "Improved Inversion Channel Mobility for 4H-SiC MOSFETs Following High Temperature Anneals in Nitric Oxide" (hereinafter "Chung"). Claims 8, 9, 13, 14, 16, 27-31 and 87 stand rejected under 35 U.S.C. § 103 as obvious in light of the '822 patent, Chung and further in view of United States Patent No. 6,221,700 to Okuno et al. (hereinafter "the

'700 patent"). Finally, Claims 5, 20, 37 and 88 stand rejected under 35 U.S.C. § 103 as obvious in light of the '822 patent, Chung and United States Patent No. 5,170,231 to Fuji et al. (hereinafter "the '321 patent").

Claims 1, 12 and 83 are independent claims. Applicants will discuss the rejection of each of these claims below.

#### Claim 1

Claim 1 recites as follows:

1. (Presently Amended) A silicon carbide metal-oxide semiconductor field effect transistor, comprising:  
a double implant silicon carbide MOSFET, having an n-type silicon carbide drift layer, spaced apart p-type silicon carbide regions in the n-type silicon carbide drift layer and having n-type silicon carbide regions therein, and a nitrided oxide layer on the n-type silicon carbide drift layer; and  
n-type shorting channels extending from respective ones of the n-type silicon carbide regions through the p-type silicon carbide regions and to the n-type silicon carbide drift layer, **wherein the n-type shorting channels extend to but not into the n-type silicon carbide drift layer.**

Applicants submit that at least the highlighted portions of Claim 1 are neither disclosed nor suggested by the cited references.

In particular, the Official Action cites to layer 5 of the '822 patent as disclosing, among other things, the n-type shorting channels. However, layer 5 of the '822 patent extends completely across the p-type regions 3a, 3b and across the drift layer 2. See e.g., '822 patent, Figs 1, 4, 6A-6C. As such, the layer 5 of the '822 patent does not disclose or suggest shorting channels that "extend to but not into the n-type silicon carbide drift layer" as recited in Claim 1. Accordingly, Applicants submit that each of the recitations of Claim 1 are neither disclosed nor suggested by the '822 patent. Furthermore, as Chung does not discuss shorting channels, there is no indication in Chung that shorting channels that extend to but not into the drift layer be provided. As such, Applicants submit that Claim 1 and the claims that depend from Claim 1 are neither disclosed nor suggested by the '822 patent and Chung.

#### Claim 12

Claim 12 recites as follows:

12. (Presently Amended) A silicon carbide device comprising:  
a drift layer of n-type silicon carbide;  
first regions of p-type silicon carbide in the drift layer, the first regions of p-type silicon carbide being spaced apart and having peripheral edges which define a region of the drift layer therebetween;  
first regions of n-type silicon carbide having a carrier concentration greater than a carrier concentration of the drift layer in the first regions of p-type silicon carbide and spaced apart from the peripheral edges of the first regions of p-type silicon carbide;  
second regions of n-type silicon carbide having a carrier concentration less than the carrier concentration of the first regions of n-type silicon carbide and which **extend from the first regions of n-type silicon carbide to, but not substantially beyond, the peripheral edges of the first regions of p-type silicon carbide;** and  
a nitrided oxide layer on the drift layer, the first regions of n-type silicon carbide and the second regions of n-type silicon carbide.

Applicants submit that at least the highlighted portions of Claim 12 are neither disclosed nor suggested by the cited references.

As discussed above, the cited portions of the '822 patent describe a layer 5 that extends completely between the n<sup>+</sup> regions 4a and 4b and extends completely across the drift layer 2. As such, Applicants submit that the '822 patent does not disclose or suggest the second regions of n-type silicon carbide that "extend from the first regions of n-type silicon carbide to, but not substantially beyond, the peripheral edges of the first regions of p-type silicon carbide" as recited in Claim 12. Accordingly, Applicants submit that Claim 12 and the claims that depend from Claim 12 are neither disclosed nor suggested by the cited references.

#### Claim 83

Claim 83 recites as follows:

83. (Presently Amended) A silicon carbide metal-oxide semiconductor field effect transistor, comprising:  
a silicon carbide MOSFET, having an n-type silicon carbide drift layer, spaced apart p-type silicon carbide regions in the n-type silicon carbide drift layer and having n-type silicon carbide regions therein, and a nitrided oxide layer on the n-type silicon carbide drift layer;

a region between the n-type silicon carbide regions and the drift layer and is adjacent the nitrided oxide layer that is configured to self deplete upon application of a zero gate bias; and

**wherein the region that is configured to self-deplete extends to but not into the n-type silicon carbide drift layer.**

Applicants submit that at least the highlighted portions of Claim 83 are neither disclosed nor suggested by the cited references.

As discussed above, the cited portions of the '822 patent describe a layer 5 that extends completely between the n+ regions 4a and 4b and extends completely across the drift layer 2. As such, Applicants submit that the '822 patent does not disclose or suggest a region that is configured to self-deplete that "extends to but not into the n-type silicon carbide drift layer" as recited in Claim 83. Accordingly, Applicants submit that Claim 83 and the claims that depend from Claim 83 are neither disclosed nor suggested by the cited references.

### **Conclusion**

Having addressed each of the issues raised in the Official Action, Applicants submit that the present application is in condition for allowance, which action is respectfully requested.

Respectfully submitted,

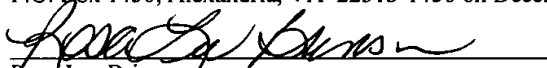


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